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ROBOTICS WITH NATURAL LANGUAGE COMPREHENSION AND
LEARNING ABILITIES(U) ILLINOIS UNIV AT URBANA

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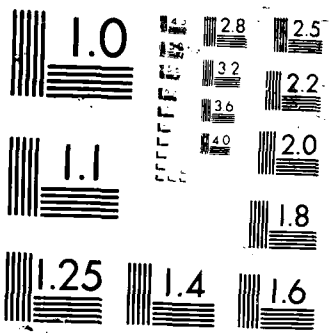
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During this period the Senior Researcher and Principal Investigator left the University of Illinois for an industrial position in Massachusetts. No papers are cited in the report. The departure was hectic and disorganized and this report addresses only the projects ongoing under the director of Professor DeJong. The contract is not expected to be renewed due to budget constraints.

January, 1985 Final Report
Robotics with Natural Language Comprehension and Learning Abilities
Contract F49620-82-K-0009
Gerald DeJong
Coordinated Science Laboratory
University of Illinois
Urbana, IL 61801

1984 has been an unsettled time for the artificial intelligence group at the Coordinated Science Laboratory. It saw the departure of the senior researcher, Professor David Waltz, who left for an industrial position in Massachusetts. The departure was particularly disruptive to the report generation process of this Air Force contract as Professor Waltz was the Principal Investigator. His departure, while not sudden, was hectic and disorganized. This interim report specifies the state as of January 1985 of projects ongoing under my direction.

— Research is progressing on two fronts: our learning robotics system and natural language processing. The robotics system is nearly implemented. It will run in INTERLISP on a XEROX 1108 Lisp Processor. Most of the major component sub-systems have been finished. A solid modeling system has been implemented to support the reasoning necessary for manipulation of pieces within a workspace. It can model cylindrical and rectangular solid primitives which can be added and subtracted to form complex pieces. Thus, a full constructive solid modeling system has been completed. As an aside, a graphics package has been developed which is capable of presenting any of the complex pieces on a bitmapped video screen as correct perspective wire-frame drawings. A schema organization sub-component has also been developed. It maintains three schemata in three statuses: inactive, suggested, and activated. A few of the

schemata have been written to test the system, but we anticipate having to redo many of them as we gain experience with the system and further refine the code. We hope to have the implementation completed in the next reporting period and are investigating the possibility of interconnecting our learning robot control system to an actual manipulator arm of the Mechanical Engineering Department here at the University of Illinois. There are three possible manipulator arms: a General Electric 5 degree arm, a smaller PUMA 6 degree arm, and a 5 degree MicroBot teaching arm. We view the PUMA as the most attractive alternative at this point.

There are three projects proceeding in the area of natural language processing. The first, called GENESIS, is a system to learn better processing language processing techniques by the acquisition of schemata while it is processing. We have successfully completed programming that system to process an abduction story and generalize a new schema for the concept of KIDNAPPING. The benefit of learning is easily demonstrated by the system. It is given an initial story which is beyond its ability to process. After determining that it cannot tie the story events together causally, it gives up. A second story, easier than the first, is given to the system. After it is successfully processed, the system examines the causal structure of the story to discover the critical inferences necessary to make sense of the story. This explanation is then generalized and stored as a schema. With the use of this new schema, the system can then correctly process the first story which was previously beyond its capability. A second project has to do with developing a connectionist account of natural language processing. In

it, each language construct, whether it be syntactic, or semantic in nature is represented as an active processing node. These nodes propagate "activation" among them depending on existing world knowledge, linguistic knowledge, and an input sentence. In this view, syntactic, semantic, and pragmatic processing are tightly integrated. We anticipate that such a system will solve a number of troublesome problems that plague conventionally designed natural language systems. Finally, we have started investigating some high level language phenomena. These include speaker intentions, morals, and themes of natural language. This research is being jointly advised and funded with a professor in the Psychology Department here at the University of Illinois.

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